SOMETHING NEW ABOUT VENUS

D. Martynov

National Aeronautics and Space Administration
Goddard Space Flight Center

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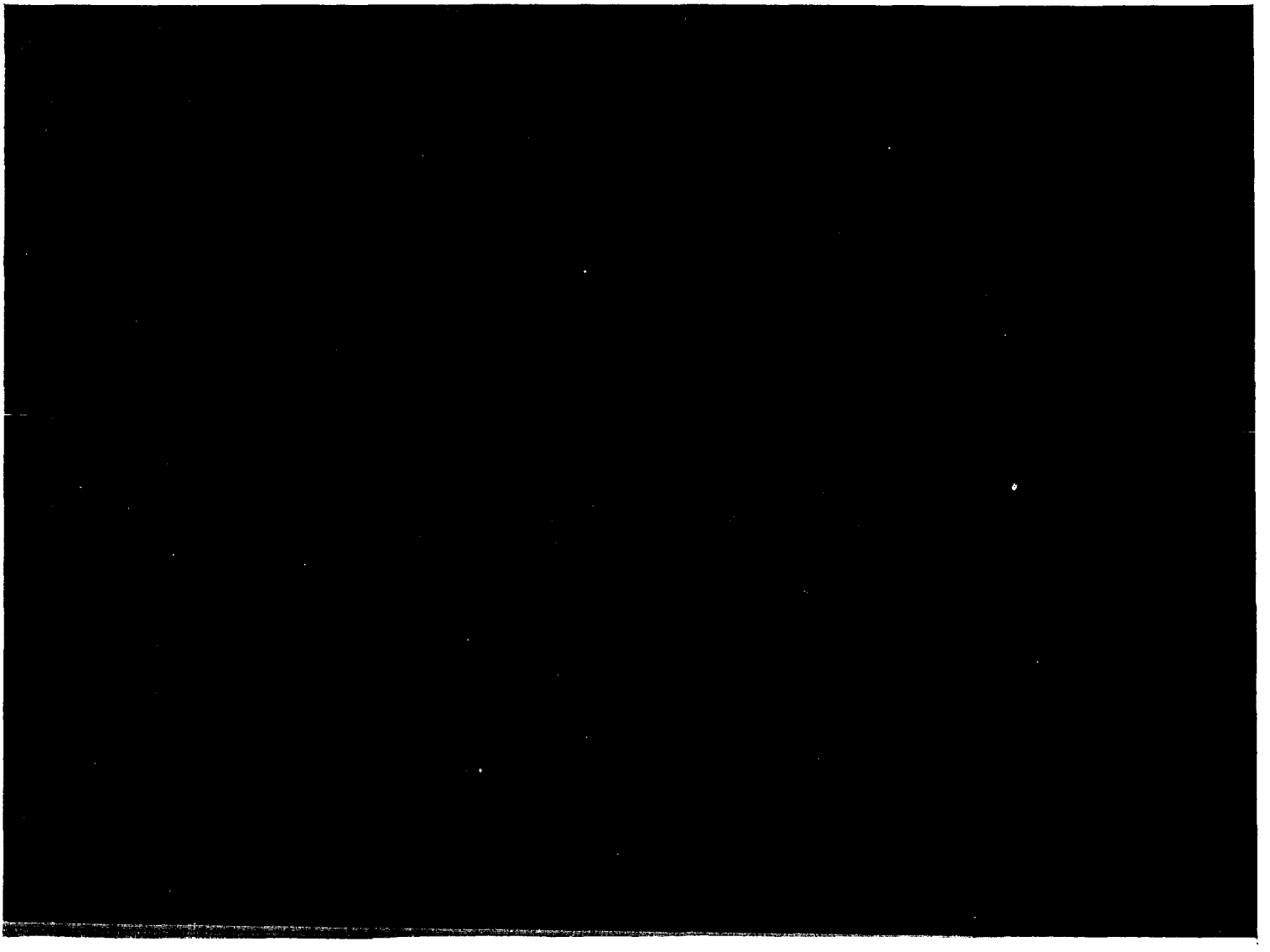

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SOMETHING NEW ABOUT VENUS

by

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[USSR]

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SOMETHING NEW ABOUT VENUS

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by Prof. D. Martynov
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SUMMARY

On 12 June of the current year, the Soviet cosmic rocket (VENUS-4) took off toward planet Venus with an interplanetary station. Its flight will last more than four months. The present column is devoted to the enigmas of this planet.

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Venus is the nearest planet to us of the solar system. It rotates around the Sun at the distance of 109,000,000 kilometers, effecting a total revolution in 225 terrestrial days. When Venus is in the lower conjunction, i. e., between the Earth and the Sun, its distance from the Earth may become less than 40,000,000 kilometers. No other planets get as close to Earth as does Venus.

Our closest cosmic neighbor is often called "sister of the Earth", and nobody had objected against such a comparison till the last decade. In reality its mass and dimensions are only just a little smaller than those of our own planet. As the Earth, Venus is surrounded by a dense atmosphere, which is filled in the upper layers by clouds strongly resembling those of the Earth. But on Earth clouds converge or diverge at times, on Venus the cloud layer is very steady, so that there is no possibility of drawing a chart of venusian surface. The same cause has prevented to determine with what period Venus rotates about its axis. Even the rotation direction remained unknown. The only thing that was reliable, is that the rotation is very slow.

The theoretical calculations, based upon the assumption of analogy of both planets' atmospheres, lead to the estimate of average temperature of Venus as being between +40 and +50°C. A good corroboration of this was found during direct measurement of the temperature of Venus' cloud layer. It was found to be about −40°. The same or even lower temperature is encountered on Earth at cirrus cloud level.

(*) NOVOYE O VENERE

Spectral analysis has shown that there is very little water vapor on Venus but a great deal of carbon dioxide, from 100 to 1000 times more than in the Earth's atmosphere. But there are no reliable signs of any kind to suggest the presence of oxygen. Nor anything is known about nitrogen. All these data refer fundamentally to above-cloud layers of Venus' atmosphere.

The thermal flux, originating from Venus in centimeter waves, was first reliably detected and measured in 1956. The result was entirely unexpected. The flux was found to be significant and corresponded to temperatures in the range +300 – +350°. Subsequent intensified observations of Venus by means of radiotelescopes in our country and in the USA and England only confirmed these figures, and then the question arose immediately: how can this be ? The most substantiated theory looks as follows.

The temperature +300 – +350° refers to the hard surface of the planet. At cloud level the temperature is –40°. In order to make such a drop possible, there must lie between the clouds and the surface a powerful atmosphere with thickness of not less than 50 kilometers. Then the atmosphere pressure on the surface of Venus must be enormous, from 5 to 50 atm., i. e.,from 50 to 500 tons per m^2, according to various calculations. Such high pressures and temperatures make the landing of a spacecraft on Venus either impossible or extremely difficult. If earlier Venus was considered, with a certain strained interpretation, as the "terrestrial paradise", now we are compelled to speak in terms of a true "hell".

But where is the source of such high temperatures? As is well known, planets differ from stars in that their proper heat reserves are insignificant and their temperature regime on the surface is determined by the amount of heat they receive from the Sun, and the amount they emit back to space. These two quantities must be identical to make the thermal equilibrium on the planet possible. But at what temperature ? This depends on the physical properties of the atmosphere. If the atmosphere is quite nontransparent to infrared rays and quite transparent to the radiation visible to naked eye, the equilibrium will be established at high temperature, i. e. there will take place exactly what actually is observed on Venus. The glass, successfully used in greenhouses, is endowed with identical properties to retain infrared rays. The phenomenon itself is called the greenhouse effect. Unfortunately, to date we still are unaware of any gas, amongst those in presence, that would be endowed with so strong a greenhouse effect, as that required for sustaining the high temperature of Venus. And consequently, we are in no position to explain why Venus is so hot.

There was no flaw in the attempts to by-pass this difficulty. The first reaction to it consisted in that the greenhouse effect theory was generally bound to be dropped, and that the temperature of +350° ought to be viewed not as the temperature of Venus' surface but of the uppermost layers of the atmosphere, that is, of the ionosphere lying substantially above clouds. Its emission will be quite weak in visible and infrared rays, and strong in the radioband. But in this case, this would be a very dense ionosphere, 1000 times denser than the Earth's ionosphere, and this situation is unintelligible and thus unacceptable.

Temperature measurements of Venus revealed a curious fact, i. e. the practical equality of temperatures on the day and night sides of the planet. This is strange. A day is very long on Venus, and both the day and the night are prolonged. During the day the surface of Venus must be strongly heated, and it must cool off during the night despite the enveloping atmosphere. However, if there is no such thing, it means that the planet has sufficiently large reserves of proper heat.

As is well known, in the course of the past few years radiophysicists of three countries, including our own, the group of academician V. A. Kotel'nikov, succeeded in radar locating Venus, i. e. to dispatch a radiosignal and receive its reflection. Thus emerges the possibility of breaking through the cloud wrap of Venus and of drawing in the future its radiochart. But now already radar location of Venus contributed most important results, in that the reflected radiosignal has shown that Venus rotates about its axis very slowly. Moreover, it rotates toward the side opposite to its yearly motion around the Sun, case almost exceptional in our entire Solar System.

Striving to understand the physical nature of Venus, scientists apply newer and newer means of investigation. One of the most effective amongst these in our times is the dispatching toward Venus of observational automatic stations on cosmic rockets. Even without landing a great deal can be learned in the course of space station's fly-by the planet.

In this case the planet will appear for all the various devices on board the station not as a minuscule disk or crescent, but as a large disk or crescent, covering'half of the sky', so that the study of the planet may be conducted not "in general and as a whole", but in detail, by parts. The planet may then be studied in ultraviolet, infrared, in micro and submicrowaves, without interference from the terrestrial atmosphere. It is only of importance that the apparatus operate without failure, and that the information flow without a hitch.

Let us hope that the flight of our cosmic "envoy" will bring us new and important discoveries, which we, astronomers, await with impatience.

**** THE END ****

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